IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of
Eiji OKABE et. al. : Docket No. 19629.0002
Serial No. 10/726,292 : Group Art Unit: 1756
Filed December 2, 2003 : Examiner: Shean C. Wu
For: LIQUID CRYSTAL COMPOSITION AND
LIQUID CRYSTAL DISPLAY ELEMENT

DECLARATION UNDER RULE 1.132

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sir:

I, Yoshitaka Tomi of 2-17, Tatsumidaihigashi, Ichihara, Chiba, Japan, declare:

THAT I am by profession a research chemist having the degree of Engineering person earned from Department of Chemistry, Faculty of Science, Toyohashi University of Technology in March 1989, and was awarded Master of Engineering issue from Toyohashi University of Technology in March 1991;

THAT I have been employed by Chisso Corporation of Kitaku, Osaka, Japan, the Assignee of the above-identified U.S. patent application since April 1991, and I have been

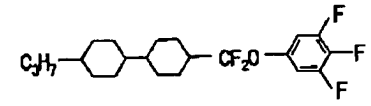
engaged in research mainly on physical and chemical behavior of liquid crystal materials from April 1991 up to now;

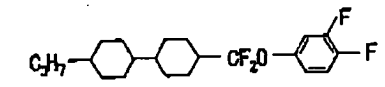
THAT I am a joint inventor of the above-identified application, and hence, I am fully familiar therewith; and

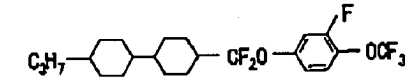
THAT in order to demonstrate unobviousness of the claimed invention over the invention disclosed in US 6,007,740 and US 6,323,298 cited by the examiner, I carried out a comparative experiment in the following.

## Comparative Experiment

1. As a typical compound by US6,007,740, a compound (a) is selected, while as typical compounds expressed by formula (1-2) of the present application, compounds (b) and (c) are selected.

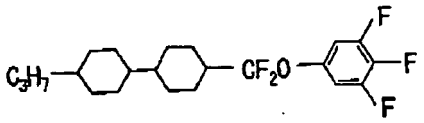
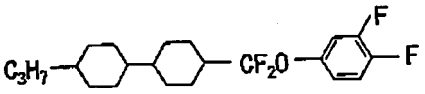
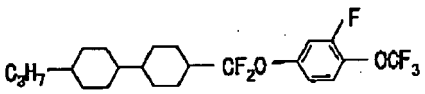
compound (a): 

compound (b): 

compound (c): 

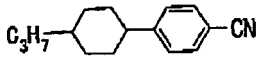
Comparison is made between these compounds with regard to their characteristics relating to the upper limit temperature of nematic phase and viscosity both of which are target items of the present invention. The result of the comparison is shown in Table 2 below.

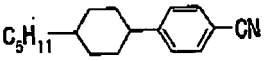
Table 2 Comparison of compounds

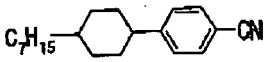
| | | Upper limit temperature of nematic phase (°C) | Viscosity(mPa·s) |
|---|---|---|---|
| compound(a) |  | 88.4 | 41.1 |
| compound(b) |  | 108.4 | 30.0 |
| compound(c) |  | 103.0 | 33.0 |

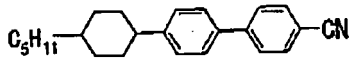
Note : Upper limit temperature of nematic phase and viscosity are each an extrapolated value obtained by measuring 15wt% mixture of the sample in mother liquid crystal composition(A).

Mother liquid crystal composition(A)

 24%

 36%

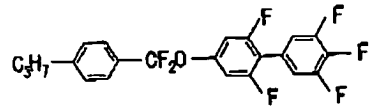
 25%

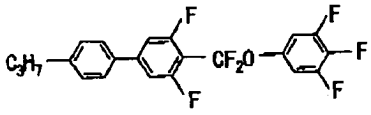
 15%

As clearly shown in the table, the compound (a) has a lower upper limit temperature of nematic phase than that of compound (b) and (c). Also the compound (a) has a higher viscosity than that of compound (b) and (c).

2. As a typical compound from US6,007,740, a compound (d) is selected, while as a typical compound expressed by

formula (1-3) of the present application, compound (e) is selected.

compound (d): 

compound (e): 

Comparison is made between these compounds with regard to their characteristics relating to the lower limit temperature of nematic phase, which is a target item of the present invention.

As for the lower limit temperature of nematic phase for a compound, as its experimental procedure is not concretely described in the specification of the present application, the Applicant would like to describe it in detail in the following remarks and experimental procedures:

Experimental procedure regarding the lower limit temperature of nematic phase for a compound -

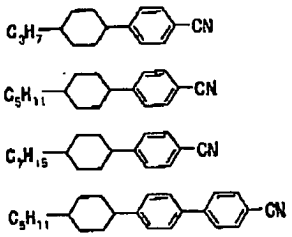
(1) Samples (compounds) are mixed with a mother liquid crystal composition (A) each in an amount of 15, 10, 5, 3 and 1 wt%.

(2) Samples prepared in (1) are left standing in a freezer set at -20℃ for 30 days.

(3) After 30 days, samples are checked by the naked eye to determine whether or not the sample exhibits nematic phase.

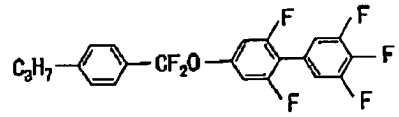
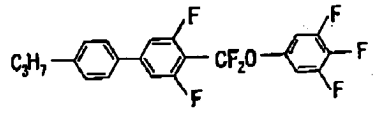
(4) If the sample exhibits nematic phase, the result is expressed as O, while the result is expressed as X if the sample exhibits crystalline phase or smectic phase.

Mother liquid crystal composition (A) :



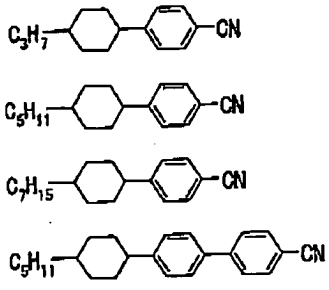

The result of the comparison is shown in Table 4 below.

Table 4 Comparison of compounds(2)

| | | Concentration of sample | | | | |
|---|---|---|---|---|---|---|
| | | 15wt% | 10wt% | 5wt% | 3wt% | 1wt% |
| compound(d) |  | × | × | × | O | O |
| compound(e) |  | O | O | O | O | O |

Note : Mixing each sample in the mother liquid crystal composition (A) in 15, 10, 5, 3 and 1wt% and left standing in a freezer set at -20°C for 30 days.
O means nematic phase
× means deposition of crystals or smectic phase

Mother liquid crystal composition(A)



As clearly shown in the table,

① When concentration of the sample is 15 wt%, the compound(d) exhibits crystalline phase or smectic phase at -20℃, while the compound(e) exhibits nematic phase. Namely the compound(e), that is, formula (1-3) of the present application has the effect of lowering the lower limit temperature of nematic phase of the composition further than the compound disclosed in US6,007,740.

② To keep nematic phase at -20℃, the mixing proportion of 3 wt% at maximum is the limit for the compound(d), while 15 wt% or more at maximum for the compound(e). Namely the compound(e), that is, formula (1-3) of the present application can be mixed in a greater amount than the compound disclosed in US6,007,740.

3. Next the Applicant will explain concretely through experiments that US6,007,740 does not teach formula (1-1) of the present application as provided with specifically excellent characteristics. As a representative from US6,007,740, Applicant selected Use Example 24 which is cited by the Office in the rejection under U.S.C.102(b). For reference, this Use Example is identical to the composition described in Comparative Example 8 of the present application. As representatives from the present application, Applicant selected Examples 1, 3, 4, 5, 10, 11 and 12 which are compositions including formula (1-1) of the

present application. Comparison is made among these compounds with regard to their characteristics relating to the lower limit temperature of nematic phase and dielectric anisotropy which are target items of the present invention.

Results of the comparison are shown in Table 5:

Table 5 Comparison of characteristics between the present invention and US6,007,740

| | Typical composition of US6,007,740 | Typical composition of the present application | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Use Example 24 | ex1 | ex3 | ex4 | ex5 | ex10 | ex11 | ex12 | Range of characteristic of the present application |
| Tc (℃) | < -20 | < -30 | < -30 | < -30 | < -30 | < -30 | < -30 | < -30 | < -30 |
| Δε | 8.3 | 10.6 | 12.6 | 12.2 | 13.2 | 10.8 | 13.5 | 10.6 | 10.6 ~ 13.2 |

As clearly shown in the table, the lower limit temperature (Tc) of nematic phase of the composition of US6,007,740 is below -20℃, while that of the composition of the present application is below -30℃. The composition of the present application has lower limit temperature of nematic phase lower than that of US6,007,740. Also, the dielectric anisotropy of the composition of US6,007,740 is 8.3 while those of the compositions of the present invention are in the range of 10.6 to 13.2. The composition of the present invention has a dielectric anisotropy larger than that of US6,007,740.

THAT based on these results, it is my belief that the composition of the application has superior physical

properties to that of the reference and that the improvement caused by the combination of the first, second, and third components of the application is unexpected.

THAT I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S. Code 1001 and that such willful false statements may jeopardize the validity of this application or any patent issued thereon.

September 28, 2004

Yoshitaka Tomi

Yoshitaka Tomi